HEARING PROTECTION

Approved Types of HPD's:

- Earplugs
  - Pre-formed
  - Hand-formed
- Noise Muffs
- Ear Canal Caps
- Helmets

NOISE REDUCTION RATING (NRR)

- ***All hearing protection devices have a Noise Reduction Rating which indicates the attenuation level of the hearing protection in a laboratory setting***
- ***Keep in mind that the NRR does not accurately reflect attenuation in the real world***
- ***Field testing suggests that the actual NRR is approximately half of what is listed on the package***

Pre-Formed Earplugs

- Single Flange:
  - Noise Reduction Rating (NRR)=23dB
  - 5 color-coded sizes:
    - White (Extra Small)- 10% o the population
    - Green (Small)- 25%
    - Orange (Medium)-30%
    - Blue (Large)- 40%
    - Red (Extra Large)- 25%

FITTING TECHNIQUE:

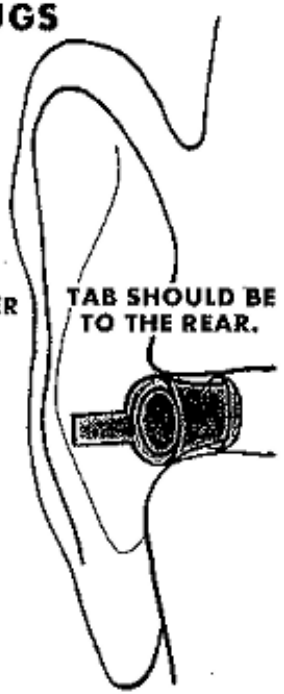
FOR MAXIMUM PROTECTION AND COMFORT, INSERT SINGLE FLANGE EARPLUGS AS FOLLOWS:

1. MAKE THE EAR CANAL ACCESSIBLE BY REACHING OVER HEAD WITH OPPOSITE HAND AND PULLING EAR OUTWARD.

2. GRASP PLUG TAB BETWEEN THUMB AND FOREFINGER AND INSERT PLUG INTO EAR CANAL.

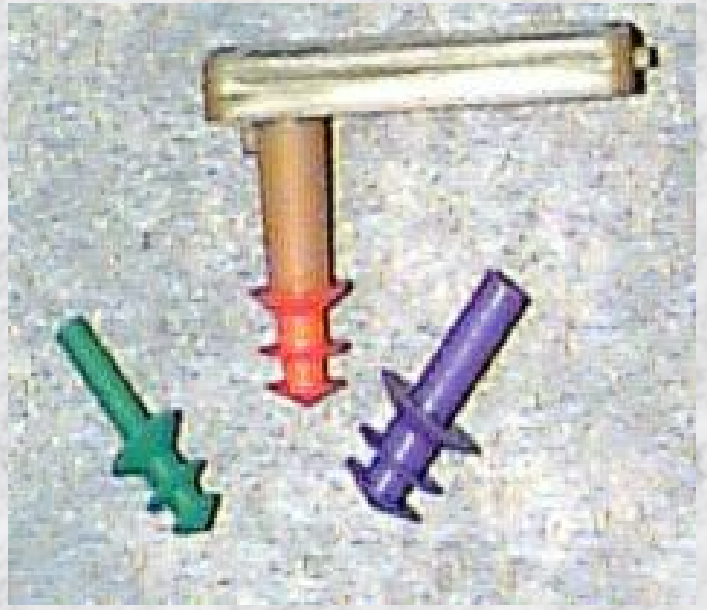
3. PUSH AND TWIST PLUG TOWARD REAR-CENTER OF HEAD UNTIL SEAL IS MADE.

4. IF A GOOD SEAL IS NOT OBTAINED, USE SMALLER OR LARGER SIZE. SINGLE FLANGE PLUGS ARE AVAILABLE IN FIVE SIZES- EX. SMALL , SMALL, MEDIUM, LARGE, AND EX. LARGE.



DA Poster 40-501C, Apr 1991 DISTRIBUTION: To be distributed in accordance with DA Form 12-99, block 0556, requirements for DA Poster 40-501C.

Pre-Formed Earplugs (cont.):



- Triple Flange:
  - NRR= 26dB
  - 3 color coded sizes:
    - ***Green*** (Small)= 10% of the populations
    - ***Orange*** (Medium)=80%
    - ***Blue*** (Large)= 30%

Pre-Formed Earplugs (cont.):

- Quad-Flange

  2 color-coded sizes

  * Small (green)

  * Large (blue)

Note: Quad-Flange earplugs do not require use of earplug case insertion tool for proper fit.

FITTING TECHNIQUE:

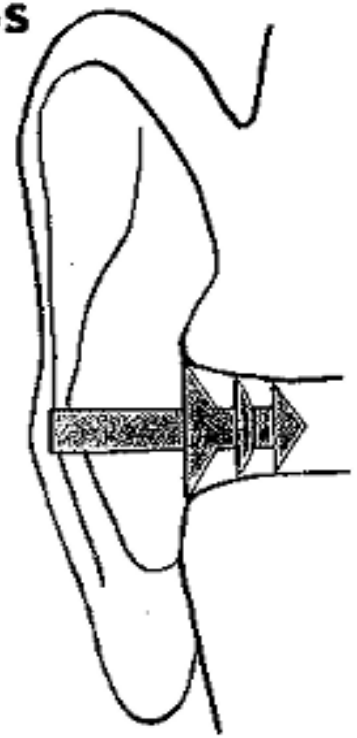
FOR MAXIMUM PROTECTION AND COMFORT INSERT TRIPLE FLANGE EARPLUGS AS FOLLOWS :

1. MAKE THE EAR CANAL ACCESSIBLE BY REACHING OVER HEAD WITH OPPOSITE HAND AND PULLING EAR OUTWARD.

2. GRASP PLUG FIRMLY BEHIND LARGEST FLANGE.

3. INSERT SMALLER FLANGE IN EAR CANAL. PUSH AND TWIST TOWARD REAR-CENTER OF HEAD.

4. IF A GOOD SEAL IS NOT OBTAINED, USE SMALLER OR LARGER SIZE. TRIPLE FLANGE PLUGS ARE AVAILABLE IN THREE SIZES- LARGE, REGULAR, AND SMALL.

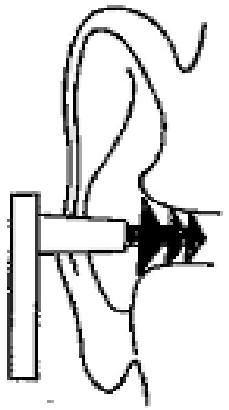


DA Poster 08-5010, Apr 1991 DISTRIBUTION: To be distributed in accordance with DA Form 12-04, block 0856, requirements for DA Poster 40-5010.

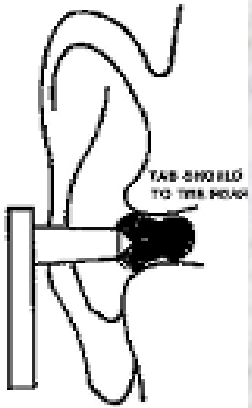
FITTING TECHNIQUE (cont.)

EARPLUG SEATING DEVICE AND CARRYING CASE

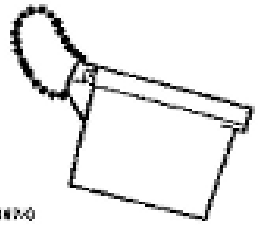
- TRIPLE-FLANGE EARPLUGS (INSERTION INSTRUCTIONS):
  - A. INSERT STEM OF PLUG IN OPEN END OF CASE LID.
  - B. PUSH AND WIGGLE PLUG TOWARD REAR-CENTER OF HEAD



- SINGLE-FLANGE EARPLUGS (INSERTION INSTRUCTIONS):
  - A. GRASP PLUG TAB BETWEEN THUMB AND FOREFINGER AND INSERT INTO EAR CANAL.
  - B. USE POINTED END OF CASE LID TO IMPROVE SNUG FIT.



- GENERAL INSTRUCTIONS:
  - A. WHEN NOT IN USE, KEEP PLUGS IN CARRYING CASE.
  - B. ENSURE THAT PLUGS ARE CLEANED WITH SOAP AND WATER AND ARE DRY WHEN RETURNED TO THE CASE.
  - C. WEAR YOUR EARPLUG CARRYING CASE (WITH EARPLUGS) AS PART OF YOUR WORK UNIFORM. THEY ARE PART OF YOUR PERSONAL ISSUE AND ARE TO BE RETAINED UPON CHANGE OF STATION.



Advantages Of Pre-Formed Earplugs:

- ***Inexpensive***
- ***Can be washed and re-used***
- ***Easily carried on uniform or clothing in earplug carrying case***

Disadvantages Of Pre-Formed Earplugs:

- *Requires individual medical fitting of both ears*
- *Frequent insertion may cause irritation*
- *Work loose with jaw movement*
- *Improper fit reduces effectiveness*

Hand Formed Earplugs (EAR Yellow Foam Plugs)

- ***Noise Reduction Rating (NRR)=29dB***

Fitting Technique For Hand Formed Earplugs:

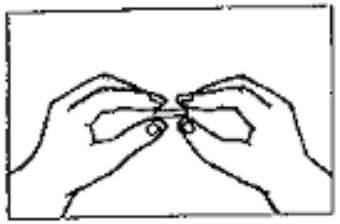
- ***Roll earplug between thumb and index finger to the smallest size possible***
- ***Pull up and back on pinna***
- ***Insert earplug so that at least 2/3 of the plug is in the ear canal***
- ***Use index finger to hold earplug in place while it expands***
- ***Ensure there are no creases in the plug***

Fitting Technique (cont):

FOAM EARPLUGS

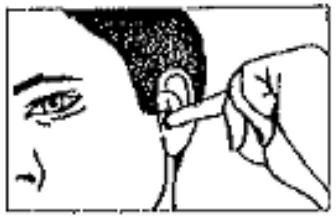
FOR MAXIMUM EFFECTIVENESS AND COMFORT INSERT FOAM EARPLUGS (NSN 6515-00-137-6345) AS FOLLOWS: IMPORTANT – HANDS AND PLUGS SHOULD BE CLEAN PRIOR TO USE. DO NOT USE WHERE HAZARDOUS CHEMICALS OR MATERIALS COULD BE TRANSFERRED TO PLUG.

1 WITH BOTH HANDS GRASP THE ROUND SIDE OF THE PLUG. SLOWLY ROLL AND COMPRESS THE PLUG INTO A VERY THIN, CREASE-FREE CYLINDER.



2 WHILE COMPRESSED, INSERT THE PLUG WELL INTO THE EAR CANAL. FITTING THE PLUG IS EASIER IF THE OPPOSITE EAR IS PULLED OUTWARD AND UPWARD DURING INSERTION.

3 WITH FINGERTIP, GENTLY HOLD THE PLUG IN PLACE UNTIL IT BEGINS TO EXPAND AND BLOCK THE NOISE. QUALITY OF FIT MAY BE ESTIMATED BY OCCLUSION.



4 EARPLUG FIT CAN BE TESTED IN THE PRESENCE OF NOISE BY ALTERNATELY COVERING AND UNCOVERING THE EARS WITH TIGHTLY PRESSED HANDS. WITH ADEQUATELY FITTED PLUGS THE NOISE LEVELS SHOULD SEEM NEARLY THE SAME WHETHER OR NOT THE EARS ARE COVERED. KEEP PLUGS CLEAN BY WASHING IN MILD SOAP AND RINSING THOROUGHLY IN WATER. DISCARD IF DISCOLORATION OR DISTORTION OCCURS AFTER CLEANING.

DA Poster 40-501B, Apr 1991 DISTRIBUTION: To be distributed in accordance with DA Form 12-09, block 0656, requirements for DA Poster 40-501B.

Advantages Of Hand Formed Earplugs:

- ***Most comfortable***
- ***Universal fit***
- ***Medical fitting not required***
- ***Least expensive HPD's for infrequent or intermittent exposure***

Disadvantages Of Hand Formed Earplugs:

- ***Must be properly molded and inserted***
- ***Easily soiled***
- ***SINGLE USE***

Characteristics Of A Good Earplug Fitting:

- ***Voices sound muffled***
- ***"Vacuum" effect***
- ***Comfortable***
- ***Single flange tab facing toward back of head***
- ***Largest flange of triple flange is flush against ear canal opening***
- ***Fit each ear individually***

GOOD FIT/BAD FIT?

GOOD FIT/BAD FIT?

GOOD FIT/BAD FIT?

GOOD FIT/BAD FIT?

GOOD FIT/BAD FIT?

GOOD FIT/BAD FIT?

Ear Canal Caps:

- ***Noise Reduction Rating (N***

Fitting Technique:

- ***Canal caps should be inserted as far into the ear canal as possible to form a seal***
- ***Headband placement can be on top of the head, behind the head, or under the chin***

Advantages Of Ear Canal Caps:

- ***Quickly inserted without soiling***
- ***Medical fit not required***
- ***Easily carried***
- ***Best for intermittent noise***
- ***Universal fit***

Disadvantages Of Ear Canal Caps:

- *More expensive*
- *Uncomfortable over time*
- *Limited Attenuation*

Circumaural Noise Muffs

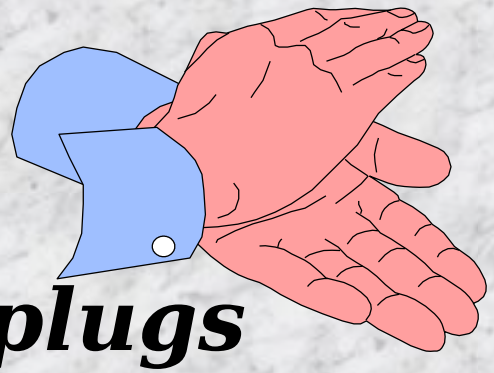
Noise Reduction Rating (NRR) - 33 dB

Fitting Technique: Circumaural Noise Muffs

- ***Noise muffs should seal around the ear***
- ***Replace ear cushions when cracked or worn***
- ***Certain types of muffs allow placement of the headband on top of the head, behind the head, or under the chin***

Advantages of Circumaural Noise Muffs

- *Universal fit*
- *Good attenuation*
- *Can be worn with earplugs*
- *Incorporation of communications equipment*
- *Medical fit not required*



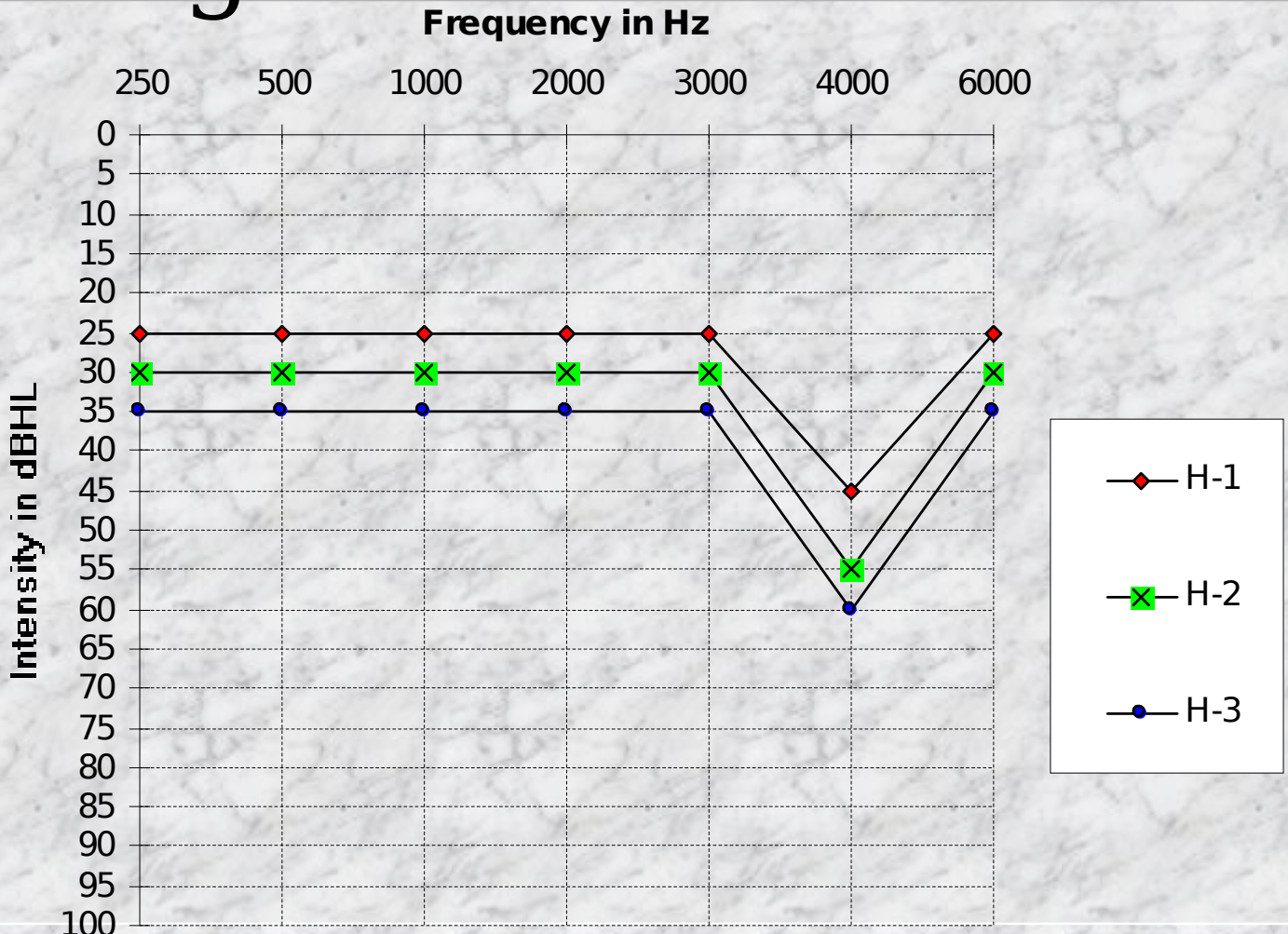
Disadvantages Of Circumaural Noise Muffs:

- ***Most expensive type of HPD***
- ***Bulky and heavy***
- ***Uncomfortable in heat***
- ***Hair/eyeglasses decrease effectiveness***
- ***Not easily carried***

Helmets: For Specific Operational Uses

- ***Aviators, Aviation Crew***
- ***Flight deck personnel***
- ***Tankers***
- ***Amphibious Assault Vehicl Crew Member***

Hearing Profile Audiogram

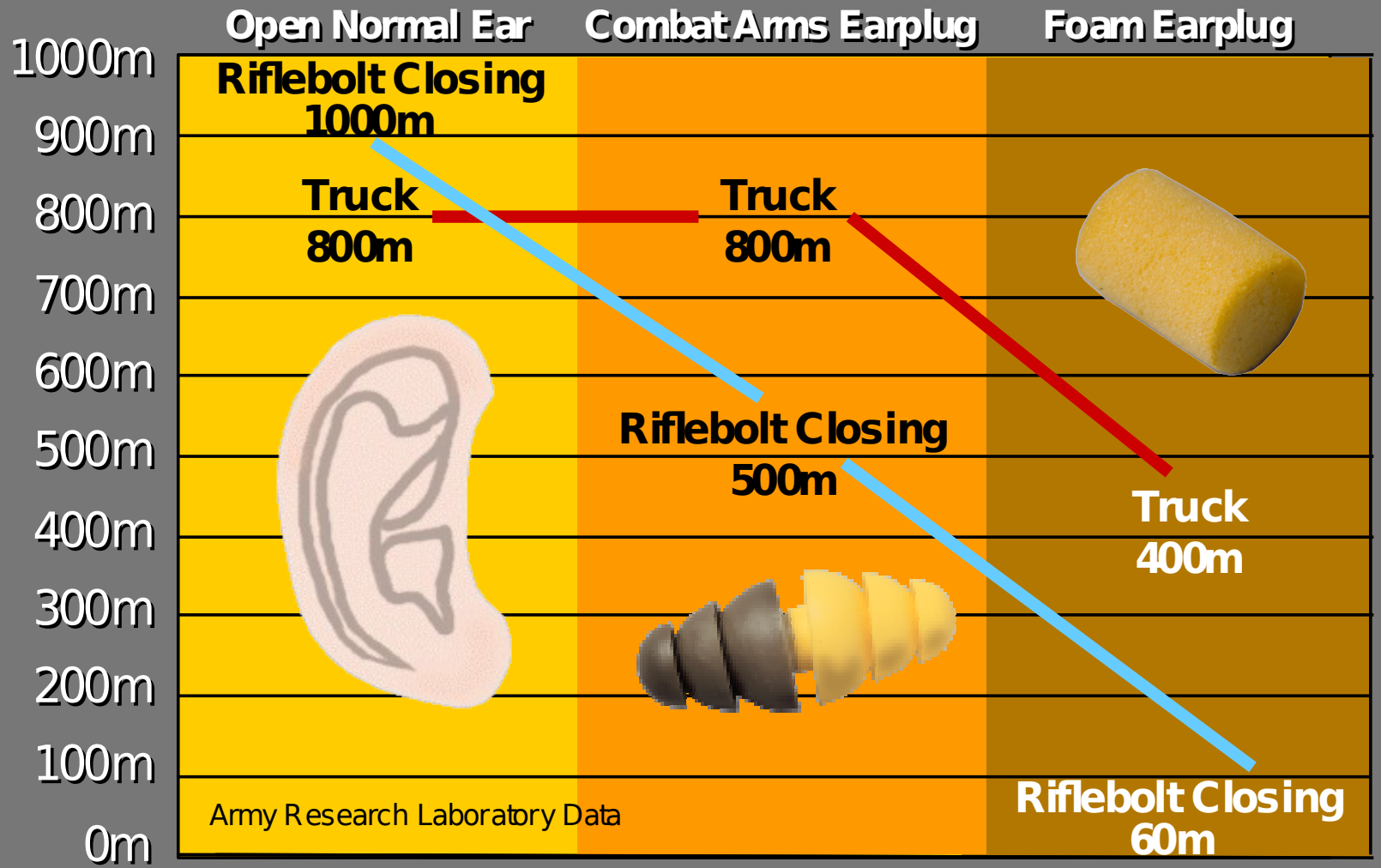


The Problem and the Ideal Solution

"Earplugs or muffs appear to be counter-indicated, with regard to speech communication in the situation where they are probably needed most – namely, in the presence of intermittent, impulsive noise, such as gunfire. Here, the wearer of earplugs or muffs cannot hear weak speech during silent intervals between impulses. The ideal solution would be a nonlinear device that would let weak sounds through at full strength but would attenuate intense sounds." pp. 68-69

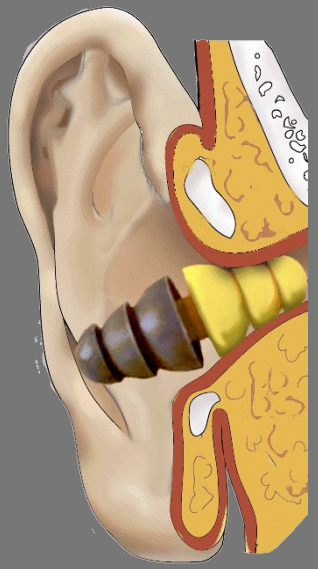
K.D. Kryter, The Effects of Noise on Man (1970) Academic Press

Detection of Sound by



Low Suburban Environmental Noise with Acceptable (H-1 Profile) Hearing Ability

USACHPPM



COMBAT ARMS EARPLUG

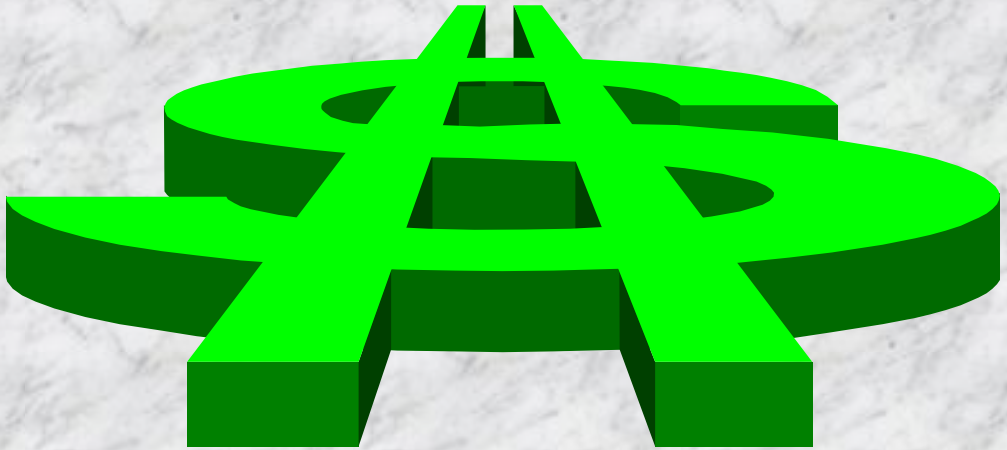
- Insert YELLOW plugs for weapons fire in dismounted mode.
- Insert OLIVE DRAB plugs for steady state noise in and around aircraft, noisy vehicles and watercraft, etc.

- Keep filter holes free of earwax and other debris.
- Check proper insertion for slight tension by gently tugging on plugs.
- Ensure that plugs are cleaned with soap and water and dry when returned to case. NSN 6515-01-466-2710

USACHPPM
U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

Funding for Hearing Protection

- ***Hearing protection is purchased by the unit or shop supervisor of the noise-hazardous area***



Hearing Protection Selection Considerations

- *Effectiveness*
  - *Only hearing protection that has been approved by the OTSG is acceptable for use in the HCP; cotton is not acceptable, as it has no noise reduction characteristics*
- *Type of hearing protection should be selected based on*
  - *Consideration of advantages / disadvantages*
  - *Work environment*
  - *Degree of noise attenuation – factory labeled Noise Reduction Rating (NRR) is not necessarily the real world attenuation level*

All Hearing Protection MUST...

- Be fitted properly
- maintain an air tight seal
- Be as comfortable as possible

Hearing Protection Selection Considerations (Cont.)

- ***Hearing protection should be used whenever the danger of noise hazard is present, regardless of the duration of the noise; hearing protection must be worn in hazardous noise levels of >84 dBA (steady state) and ≥140 dBP (impulse/impact)***
- ***Double hearing protection (plugs and muffs) are required at 104dBA and above***

Hearing Protection Selection Considerations (Cont.)

- ***Administrative control must be used along with hearing protection in extremely high noise levels (see OPNAV 5100.23D, Chapter 18, appendix 18-C for dB levels and time limits)***

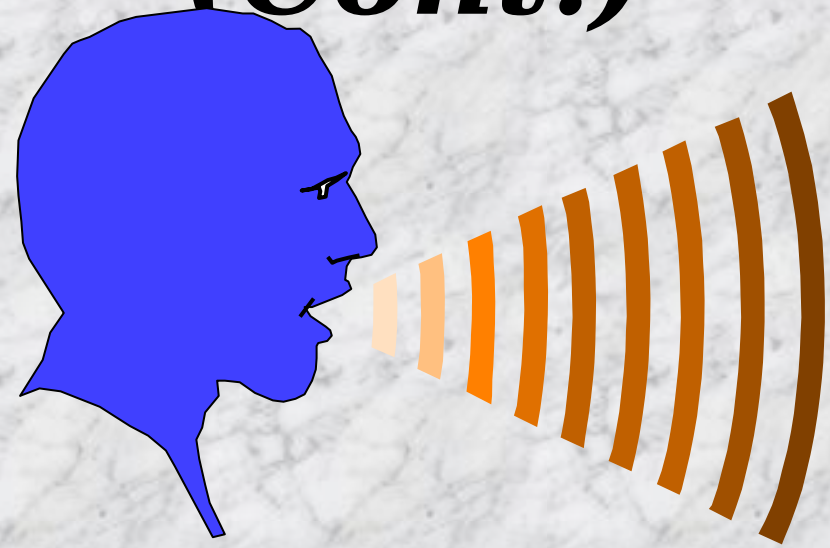
Hearing Protection and Hearing Performance

- ***Interaction of the Lombard and Occlusion Effect with the use of hearing protection allows people to assume a voice level that is appropriate to overcome the effects of noise and attenuation to permit good communication over a broad range of noise conditions***

Personal Hearing Protective Devices (HPD's) 1802.6

- **Single protection**: 84 dBA or 140 dB peak SPL
- **Double (insert and ear muff) protection**: >104 dBA
- Combine HPD's with administrative controls if HPD's do not reduce exposure below 84dBA

Hearing Protection and Hearing Performance (Cont.)



- ***<u>Lombard Effect</u> – occurs when people raise their voices in the presence of loud background noise in order to be able to monitor their speech and allow others to hear them***

Hearing Protection and Hearing Performance (Cont.)

- ***<u>Occlusion Effect</u> – with the ears plugged, people will speak more softly because they will hear their own voices more easily through bone conduction***

Hearing Protection and Hearing Performance (Cont.)

- Speech Discrimination
  - ***In quiet areas, the use of hearing protection causes reduced speech discrimination. Due to the absence of the Lombard Effect, voices are too faint to be heard well***
  - ***People with hearing loss will have more difficulty understanding speech with hearing protection due to the influence of attenuation on top of an already reduced speech discrimination ability***
  - ***People with normal hearing using hearing protection in noise hazardous areas will have improved speech discrimination because the hearing protection helps eliminate the high frequency noise and allows more of the speech frequencies to pass through***

Hearing Protection and Hearing Performance (Cont.)

- Other Performance Factors
  - ***There is a practice effect on hearing performance as people re-learn work environment sounds with hearing protection in place. With time and practice, sounds become recognizable again***
  - ***Use of hearing protection is always preferable to a progressive, permanent hearing loss***
  - ***Hearing protection can work loose while wearing and may require readjustment to maintain maximum effectiveness***

Care and Maintenance of Hearing Protection

- Hand Formed Earplugs
  - Should be disposed of after one or two uses (when soiled)
  - Hand formed earplugs are impregnated with wax and acoustic properties will change if they are washed; when soiled, they should be thrown away

Care and Maintenance of Hearing Protection (Cont.)

- **Pre-formed Earplugs / Ear Canal Caps**
  - ***Clean after each use with warm, soapy water; rinse and dry thoroughly before re-use***
  - ***Avoid insertion with soiled hands***
  - ***Check plugs periodically for correct size; inspect for deterioration***
  - ***When plugs are no longer serviceable, a new pair should be fitted and issued along with a new carrying case***

Care and Maintenance of Hearing Protection (Cont.)

- **Noise Muffs**
  - ***Wipe down ear-cup seals with moist cloth***
  - ***Replace seals when cracked or broken***
  - ***Replace cushions inside ear-cups when unserviceable***
  - ***Check for cracks or holes in ear-cups***
  - ***Ensure there is adequate headband tension; replace headband when necessary***
  - ***Modification of noise muffs is prohibited***

Employee Considerations

- ***Personnel in the Hearing Conservation Program have the right to choose which type of hearing protection they prefer to wear from among approved selections available through Navy supply channels***
- ***Hearing protection must be issued at no cost to the employee and replaced whenever lost, damaged or poorly fitted***
- ***The best hearing protection is the one that is most comfortable to the wearer (the one they will wear)***
- ***Medical contra-indications and environmental considerations may limit employee choice***

Musician Hearing Protection

- ***HPD's designed specifically for musicians and sound engineers***
- ***Medically fit and custom made for each individual***
- ***NRR = 15-25dB***

QUESTIONS??